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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/810,828	03/16/2001	Sohrab Zarrabian	OC0103US	6761

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EXAMINER
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ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 08/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/810,828	ZARRABIAN ET AL.	
	Examiner	Art Unit	
	Thomas R Artman	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-5,7,8,11-16 and 26-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-5,7,8,11-16 and 26-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4,9* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 3-5, 7-8, 11-16 and 26-31 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

Claim 27 is objected to because, in line 9, the "continuous linear detector array" lacks proper antecedence. Perhaps "continuous" should be deleted.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran (US 5,760,391) and in view of Broutin (US 6,272,157).

Narendran discloses a device (Fig.6) including:

1) a fiber optic input (shown, but not labeled),

2) collimating optics (item 32),

3) a linear variable filter (item 58) having a tapered spacer region being tapered along a tapered direction,

4) a linear optical detector array (item 36) disposed along the taper direction, and

5) the collimating optics are disposed between the fiber optic input and the linear variable filter in order to illuminate the filter.

Narendran does not specifically disclose that the linear variable filter is an edge, or short- or long-pass, filter.

Broutin teaches that edge filters are functional equivalents to etalon-based bandpass filters, as stated in col.2, lines 25-28.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute an edge filter for an etalon filter in Narendran as taught by Broutin. Edge filters are routinely used in the optical arts to isolate a desired wavelength range.

Claims 3-4, 7-8, 11-12 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran and in view of Gaebe (US 6,278,549).

Regarding claim 11, Narendran discloses a demultiplexing device (Fig.6), including:

1) a fiber optic input,

2) magnifying lens and collimating lens (item 32, col.4, lines 25-27),

3) the filter is a linear variable bandpass filter having an etalon structure with a tapered spacer region being tapered along a taper direction, and

4) a linear optical detector array disposed along the taper direction.

Narendran does not specify a thermal stability. The reference does, however, require quite high resolution which, as is well known in the art, can be easily compromised by thermal instabilities in etalon structures.

Gaebe discloses a mirror/material structure for an etalon filter that provides thermal stabilities exceeding (lower than) 50 ppm/degree Centigrade within the same optical wavelength range and temperature range (on the order of about 1 ppm/degree C, see col.4, lines 13-19, and p.8 of Applicant's disclosure for conversion factor).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Gaebe's mirror structures as well as the mirror and taper materials for Narendran's mirrors (items 60 and 62) while maintaining a tapered region (item 64) in order to provide enhanced thermal stability. Gaebe's materials and mirror structure provide a solution for improved thermal stability, and thus improved resolution, in etalon devices.

With respect to claims 3 and 4, Gaebe's structural teachings include first and second reflectors that have alternating layers of silicon dioxide and high-index layers comprised of tantalum pentoxide, with a spacer region of silicon dioxide (see top of col.3).

With regards to claims 7 and 8, as explained above in the rejection of claim 11, Gaebe's structure provides thermal stabilities that are less than 10, and certainly less than 25, ppm/degree Centigrade.

In regards to claim 12, neither Narendran nor Gaebe specifically disclose the length of detector arrays. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made that one would simply choose a detector array as needed. Optical detector arrays were commercially available at the time the invention was made that exceeded the required resolution and were less than 12mm in length.

Regarding claim 27, the previously discussed combination of Narendran and Gaebe satisfy the limitations of:

1) a fiber optic input,

2) collimating optics (item 32),

3) a continuous linear variable filter having a tapered spacer region being tapered along a taper direction having a thermal stability of less than 50 parts per million per degree Centigrade of ambient temperature change,

4) a linear optical detector array with n detectors disposed along the taper direction and thus providing a nominal resolution,

5) an analyzer electrically coupled to the linear optical detector array including a memory storing a calibration array, and

6) the collimating optics are disposed between the input optical fiber and the continuous linear variable filter in order to evenly illuminate the entire filter.

The remaining limitation refers to storing a number of calibration wavelengths that exceed the number of pixels (nominal resolution) in order to provide greater resolution (smaller than the nominal resolution).

Narendran satisfies the method. It is stated in col.4, lines 37-42 and lines 53-58, that a standard calibration filter is used to define a calibration curve (data array stored by the analyzer memory) to allow accurate interpolation for greater resolution over the nominal resolution. Narendran's filter is continuously variable, and the device is designed to span the wavelength range. The maximum and minimum wavelengths are assigned to the zero and maximum pixels, respectively, and the calibration determines the relationship for how the continuum of wavelengths relate to pixel position. The calibration filter provides more wavelengths within the wavelength range than the number of pixels. In this way, a precise relationship between individual wavelengths and individual pixels is established by determining which wavelengths fall on the center of a pixel, corresponding to the greatest peak intensity received from the given pixel.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran and Gaebe and in view of Broutin.

Narendran and Gaebe do not specifically disclose that the linear variable filter is an edge, or short- or long-pass, filter.

Broutin teaches that edge filters are functional equivalents to etalon filters, as stated in col.2, lines 25-28.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute an edge filter for an etalon filter in Narendran as taught by Broutin as they are known functional equivalents. Edge filters are routinely used in the optical arts to isolate a desired wavelength range.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran and Gaebe and in view of Scobey (US 5,583,683).

Gaebe does not specifically disclose the use of niobium pentoxide; however, Gaebe teaches that other suitable materials would be reasonable to one skilled in the art (see col.3, lines 8-10).

Further, Scobey discloses that niobium pentoxide is a suitable substitute for tantalum pentoxide in optical applications.

It would have been obvious to one of ordinary skill in the art at the time the invention was made that a suitable material would be niobium pentoxide as taught by Scobey. Furthermore, such substitutions of adjacent metal ions that appear in the same column of the periodic table are generally known to be functional equivalents. The practice is quite common in optical and non-optical applications, where the bonding properties, ionic radii, etc., are sufficiently similar as to not cause undesired and/or unexpected results, such as significantly altered optical transmission through the material, distorted crystal lattices causing stress, etc.

Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran and Gaebe and in view of Takashashi (Applied Optics, vol.34, No.4, pp.667-675).

With respect to claims 13 and 14, the structure as applied above in the rejection of claim 11 applies here and the following. None of the above references characterize their devices as having a FWHM of less than or equal to about 0.6nm around a center wavelength within the typical optical communication bandwidth.

Takashashi discloses, on p.670, Table 3, that a multilayer cavity combination similar to the one used by Gaebe has a FWHM of 0.5nm within the optical communication bandwidth.

It would have been obvious to one of ordinary skill in the art at the time the invention was made that the Narendran's tapered etalon with Gaebe's tantalum pentoxide/silicon dioxide multilayer mirror/cavity combination is capable of having a similar characteristic that would fall within the specified range for improved resolution.

Further regarding claim 14, none of the above references disclose the length of the detector arrays as being 12mm. However, the use of a 12mm detector array solves not stated problem in the art. Hence, absent any showing of criticality, the provision of a 12mm detector array is considered to constitute an obvious matter of design choice.

With respect to claims 15-16, Narendran's detector array has 2,048 pixels, with a nominal resolution far below 3 Angstroms (one pixel equals roughly 0.0016nm, or 0.016 Angstroms nominal resolution, see col.6, lines 14-28).

Claims 26 and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Narendran and Gaebe and in view of Vincent (US 5,144,498).

Regarding claim 26, Narendran discloses a device, including:

1) an optical tap carrying a wavelength division multiplexed optical signal, and

2) an optical spectrometer component having:

a) a linear variable filter including an etalon structure with at least one tapered spacer region being tapered along a taper direction, and

b) a detector array having n detectors along the taper direction, thus providing a nominal resolution,

3) an analyzer coupled to the optical spectrometer so as to monitor some of a plurality of optical signals and having a memory with a calibration array of a number of wavelengths greater than the number of pixels in order to reliably provide a resolution improved over the nominal resolution (explained in the rejection of claim 27 above).

Narendran does not disclose specific thermal stabilities or an optical system with channel spacings of 200GHz or less.

Gaebe provides a material system and mirror structure that provides thermal stabilities far better than 50 ppm/degree Centigrade.

As stated above in the rejection of claim 11, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Narendran's mirror structure and material system in order to improve the thermal stability, and thus, the operating resolution.

Regarding the 200GHz-spaced optical system, Vincent specifically teaches the use of a linear variable filter as a demultiplexer in a WDM system. A WDM system with 200GHz channel spacing corresponds to a little over 1nm wavelength spacing between channels. The prior art combination above has sufficient thermal stabilities, resolution capabilities and optical fiber compatibility in order to demultiplex the channels. Furthermore, Narendran's invention is used specifically as a demultiplexer for WDM optical signals from the Bragg grating sensor. Narendran continues, in col.6, starting at line 54, that the device can be advantageously used as a demultiplexer in optical communication systems to monitor wavelengths/channels as needed.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the optical spectrometer with an optical communication system, as taught by Vincent and Narendran, with a channel spacing of 200GHz channel spacing or less in order to demultiplex such narrow channels accurately.

Regarding claim 30, Narendran discloses a device, including:

1) an optical tap carrying a wavelength division multiplexed optical signal, and

2) an optical spectrometer having a nominal resolution less than or equal to 8 Angstroms (one pixel equals roughly 0.0016nm, or 0.016 Angstroms nominal resolution, see col.6, lines 14-28), and including:

a) a linear variable filter with at least one tapered spacer region being tapered along a tapered direction, and

b) a detector array affixed to the linear variable filter,

3) an analyzer coupled to the optical spectrometer component so as to monitor each of a plurality of signals.

Narendran does not disclose specific thermal stabilities or an optical system with channel spacings of 200GHz or less.

Gaebe provides a material system and mirror structure that provides thermal stabilities far better than 50 ppm/degree Centigrade.

As stated above in the rejection of claim 11, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Narendran's mirror

structure and material system in order to improve the thermal stability, and thus, the operating resolution.

Vincent and Narendran specifically teach the use of a linear variable filter as a demultiplexer in a WDM system as stated above in the rejection of claim 26.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the optical spectrometer with an optical communication system, as taught by Vincent and Narendran, with a channel spacing of 200GHz channel spacing or less in order to demultiplex such narrow channels accurately.

With respect to claim 31, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include an analog-to-digital converter in order to take advantage of the increased speed and accuracy of digital analyzing.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Seddon (US 5,872,655) discloses a LVF with alternating layers of tantala and silica for use in the x-ray range of the electromagnetic spectrum. Kash (US 5,343,542) discloses a multilayered LVF for use as a demultiplexer in a WDM system that does not require collimating optics. Nitta (US 6,334,014) discloses a LVF structure for use as a demultiplexer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R Artman whose telephone number is (703) 305-0203. The examiner can normally be reached on 8am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on (703) 308-4858. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

Thomas R. Artman
Patent Examiner
August 11, 2003

DAVID V. BRUCE
PRIMARY EXAMINER